What is claimed is:

1. A method for depositing a material on a substrate, the method comprising:

placing a substrate in a chamber having a plasma source and on a substrate holder;

depositing a Tunable Etch Resistant ARC (TERA) layer on the substrate, by providing a processing gas comprising at least for a portion of the depositing a precursor, wherein the precursor is chosen to reduce reaction with a photoresist.

2. The method as claimed in claim 1, further comprising:

forming a plurality of photoresist features on the TERA layer, wherein at least one of the photoresist features comprises a substantially small foot.

3. The method as claimed in claim 1, further comprising:

forming a plurality of photoresist features on the TERA layer, wherein at least one of the photoresist features comprises a substantially rectangular profile.

4. The method as claimed in claim 1, further comprising:

matching at least a top portion of the TERA layer and a photoresist layer to prevent the formation of footings on the photoresist features; and

forming the photoresist layer on the top portion, the photoresist layer comprising a plurality of substantially rectangular features.

5. The method as claimed in claim 1, wherein the depositing of the TERA layer includes:

isolating a bottom portion of the TERA layer from a photoresist layer with a top portion of the TERA layer, thereby reducing the formation of footings on photoresist features in a photoresist layer.

6. The method as claimed in claim 1, wherein the depositing of the TERA layer includes:

providing a chemically inactive layer between a chemically active layer and a photoresist layer, wherein the precursor is chosen to create a dielectric material that does not chemically react with the photoresist layer.

7. The method as claimed in claim 1, wherein the depositing of the TERA layer includes:

configuring at least a top portion of the TERA layer to have a chemically inert surface, wherein a plurality of photoresist features having substantially rectangular profiles can be formed on the chemically inert surface.

8. The method as claimed in claim 1, wherein the depositing of the TERA layer includes:

configuring at least a top portion of the TERA layer to reduce resist poisoning, wherein a plurality of photoresist features having substantially rectangular profiles can be formed on the TERA layer.

9. The method as claimed in claim 1, wherein the depositing of the TERA layer comprises:

depositing a bottom portion of the TERA layer during a deposition time, wherein the bottom portion comprises a material having a refractive index (n) ranging from approximately 1.5 to approximately 2.5 when measured at a wavelength of at least one of: 248 nm, 193 nm, and 157 nm, and an extinction coefficient (k) ranging from approximately 0.10 to approximately 0.9 when measured at a wavelength of at least one of: 248 nm, 193 nm, and 157 nm.

10. The method as claimed in claim 9, wherein the bottom portion has a thickness ranging from approximately 30.0 nm to approximately 400.0 nm.

11. The method as claimed in claim 9, wherein the depositing of the bottom portion occurs at a rate from approximately 100 A/min to approximately 10000 A/min.

12. The method as claimed in claim 9, wherein the deposition time is within the range from approximately 5 seconds to approximately 180 seconds.

13. The method as claimed in claim 9, wherein the plasma source includes an RF source and the depositing of the bottom portion further comprises:

operating the RF source in a frequency range from approximately 0.1 MHz. to approximately 200 MHz; and

operating the RF source in a power range from approximately 10 watts to approximately 10000 watts.

14. The method as claimed in claim 13, wherein a second RF source is coupled to the substrate holder and the depositing of the bottom portion further comprises:

operating the second RF source in a frequency range from approximately 0.1 MHz. to approximately 200 MHz; and

operating the second RF source in a power range from approximately 0.0 watts to approximately 500 watts.

15. The method as claimed in claim 9, wherein the bottom portion is deposited by providing another processing gas comprising at least one of a silicon-containing precursor and a carbon-containing precursor.

16. The method as claimed in claim 15, wherein the providing of the another processing gas comprises flowing the silicon-containing precursor and/or the carbon-containing precursor at a rate ranging from approximately 0.0 sccm to approximately 5000 sccm.

17. The method as claimed in claim 15, wherein the another processing gas comprises at least one of monosilane (SiH_4), tetraethylorthosilicate (TEOS), monomethylsilane (1MS), dimethylsilane (2MS), trimethylsilane (3MS), tetramethylsilane (4MS), octamethylcyclotetrasiloxane (OMCTS),and tetramethylcyclotetrasilane (TMCTS).

18. The method as claimed in claim 15, wherein the another processing gas comprises at least one of CH_4, C_2H_4, C_2H_2, C_6H_6 and C_6H_5OH.

19. The method as claimed in claim 15, wherein the another processing gas includes an inert gas comprising at least one of argon, helium, and nitrogen.

20. The method as claimed in claim 9, wherein the depositing of the bottom portion further comprises:

controlling chamber pressure in a range from approximately 0.1 mTorr to approximately 100 Torr.

21. The method as claimed in claim 20, wherein the chamber pressure ranges from approximately 0.1 mTorr to approximately 20 Torr.

22. The method as claimed in claim 9, wherein the depositing of the bottom portion further comprises:

providing a DC voltage to an electrostatic chuck (ESC) coupled to the substrate holder to clamp the substrate to the substrate holder, wherein the DC voltage ranges from approximately -2000 V. to approximately +2000 V.

23. The method as claimed in claim 1, wherein the depositing of the TERA layer further comprises:

depositing a top portion of the TERA layer during a deposition time, wherein the top portion comprises a material having a refractive index (n) ranging from approximately 1.5 to approximately 2.5 when measured at a wavelength of at least one of: 248 nm, 193 nm, and 157 nm, and an extinction coefficient (k) ranging from approximately 0.10 to approximately 0.9 when measured at a wavelength of at least one of: 248 nm, 193 nm, and 157 nm.

24. The method as claimed in claim 23, wherein the plasma source includes an RF source and the depositing of the top portion further comprises:

operating the RF source in a frequency range from approximately 0.1 MHz. to approximately 200 MHz; and

operating the RF source in a power range from approximately 10.0 watts to approximately 10000 watts.

25. The method as claimed in claim 23, wherein the depositing of the top portion occurs at a rate from approximately 10 A/min to approximately 5000 A/min.

26. The method as claimed in claim 23, wherein the deposition time is within the range from approximately 5 seconds to approximately 200 seconds.

27. The method as claimed in claim 23, wherein the top layer is deposited by providing the processing gas, the processing gas comprising a precursor that includes silicon, carbon and oxygen, and an inert gas.

28. The method as claimed in claim 23, wherein the top layer is deposited by providing the processing gas, the processing gas comprising a silicon-containing precursor, a carbon-containing gas, an oxygen-containing gas, and an inert gas.

29. The method as claimed in claim 27, wherein the precursor is flowed at a rate ranging from approximately 0.0 sccm to approximately 5000 sccm, and the inert gas is flowed at a second rate ranging from approximately 0.0 sccm to approximately 10000 sccm

30. The method as claimed in claim 27, wherein the precursor comprises at least one of: tetramethylcyclotetrasilane (TMCTS) tetraethylorthosilicate (TEOS), dimethyldimethoxysilane (DMDMOS), and octamethylcyclotetrasiloxane (OMCTS),.

31. The method as claimed in claim 27, wherein the inert gas comprises at least one of argon, helium, and nitrogen.

32. The method as claimed in claim 28, wherein the processing gas comprises at least one of: monomethylsilane (1MS), dimethylsilane (2MS), trimethylsilane (3MS), and tetramethylsilane (4MS).

33. The method as claimed in claim 32, wherein the depositing of the top portion further comprises:

controlling chamber pressure to be lower than approximately 3 Torr.

34. The method as claimed in claim 33, wherein the depositing of the top portion further comprises:

controlling substrate temperature to be greater than approximately 300° C.

35. The method as claimed in claim 32, wherein the depositing of the top portion further comprises:

controlling substrate temperature to be greater than approximately 300° C.

36. The method as claimed in claim 1, further comprising:

controlling a temperature of the substrate to be in the range from approximately 0° C. to approximately 500° C.

37. The method as claimed in claim 1, further comprising:

controlling the temperature of at least one chamber wall of the chamber.

38. The method as claimed in claim 37, wherein the temperature of the at least one chamber wall ranges from approximately 0° C. to approximately 500° C.

39. The method as claimed in claim 1, wherein a shower plate assembly is coupled to the chamber and the method further comprises:

controlling a temperature of the shower plate assembly.

40. The method as claimed in claim 39, wherein the temperature of the shower plate assembly ranges from approximately 0° C. to approximately 500° C.

41. A method for depositing a material on a substrate, the method comprising:

placing a substrate in a chamber having a plasma source and on a substrate holder;

depositing a first portion of a Tunable Etch Resistant ARC (TERA) layer on the substrate, wherein a first processing gas comprising a first precursor is provided to the chamber; and

depositing a second portion of the TERA layer on the first portion of the TERA layer, wherein a second processing gas comprising a second precursor is provided to the chamber, wherein the second precursor is chosen to reduce reaction with a photoresist.